

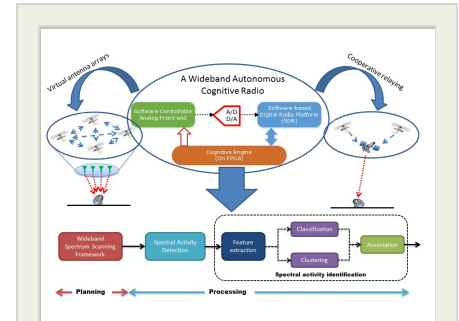
Wideband Autonomous Cognitive Radios for Networked Satellites Communications, Phase I

Completed Technology Project (2015 - 2016)



Project Introduction

There is growing recognition that success in a variety of space mission types can be greatly enhanced by making current communication transceivers and networks evolve towards networked communication systems that are intelligent, self-aware and thus can support greater levels of autonomy. This will be especially relevant as networked clusters of smaller-size satellites, made of CubeSats or microsatellites, are more and more used in place of a single monolithic satellite. The proposed wideband autonomous cognitive radios (WACRs) provide an ideal approach to achieving such autonomous and network-aware communications. The BlueCom team proposes to design and develop WACRs during the Phase I of this project by integrating a real-time reconfigurable radio front-end and a field programmable gate array implemented cognitive engine on to a software-defined radio (SDR) platform. WACRs will have the ability to sense state of the RF spectrum and network and self-optimize its performance in response to the sensed state. The cognitive engine is made of machine-learning aided algorithms to achieve this goal. The SDR platform coupled with a real-time reconfigurable RF front-end will allow the WACR to reconfigure its communication mode as directed by the cognitive engine. This will enable a WACR to overcome communications challenges encountered in space applications including interference, deep fading, waveform agility, delay and very low SNR by dynamically changing its mode of operation. This type of self-aware, autonomous and intelligent communication is what will be required to exploit the full benefits of networked clusters of satellites (e.g. CubeSats) in various mission types including earth monitoring and unmanned autonomous lunar/ planetary exploration. Phase I deliverables will include a detailed design of a WACR system architecture and a cognitive engine as well as development of cognitive algorithms and a real-time reconfigurable RF front-end/antennas.



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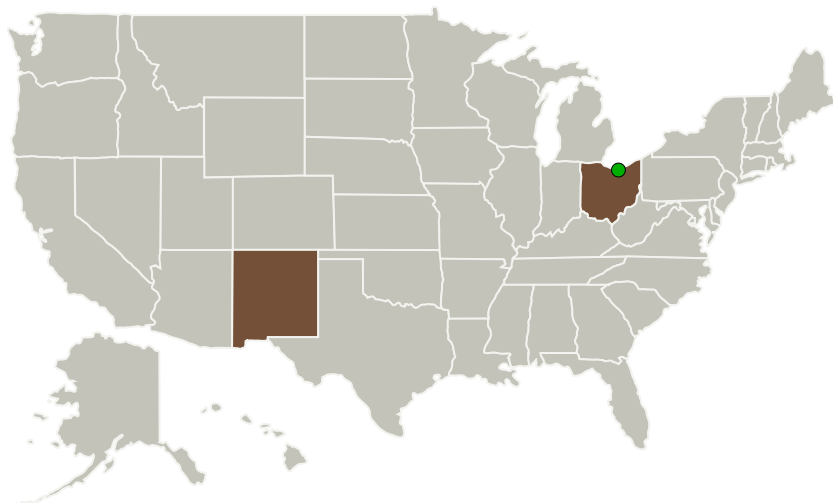
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Bluecom Systems And Consulting, LLC	Lead Organization	Industry Small Disadvantaged Business (SDB)	Albuquerque, New Mexico
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
University of New Mexico-Main Campus	Supporting Organization	Academia	Albuquerque, New Mexico

Primary U.S. Work Locations

New Mexico	Ohio
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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Bluecom Systems And Consulting, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

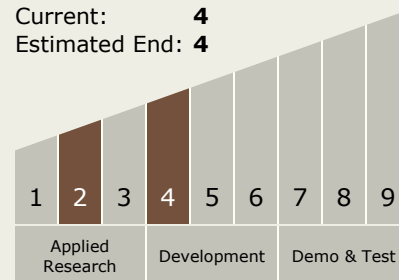
Christos Christodoulou

Technology Maturity (TRL)

Start: 2

Current: 4

Estimated End: 4





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Project Transitions

 **June 2015:** Project Start

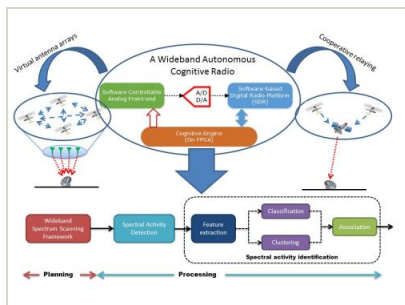
 **June 2016:** Closed out

Closeout Summary: Wideband autonomous cognitive radios for networked satellites communications, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/139436>)

Images



Briefing Chart Image

Wideband autonomous cognitive radios for networked satellites communications, Phase I

(<https://techport.nasa.gov/image/127276>)

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
 - TX05.5 Revolutionary Communications Technologies
 - TX05.5.1 Cognitive Networking

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System